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AUTHOR Rickinson, Mark
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ABSTRACT

Enhancing the educational research communication between educational researchers and educational practitioners has seen a great increase of interest in recent years. This paper reviews environmental education research evidence and examines the nature and quality of current educational research on students and student learning. There are three focal points in this review: (1) the increasingly diverse nature of the research field in environmental education; (2) the need for reviews focused on the nature of the research; and (3) recognition of the importance of research on students and learning. The methodologies used in this review are systematic, comprehensive, and analytical. The materials included in the review involve any environmental education activity undertaken in school or under the auspices of the school. The Review Framework is appended. (Contains 48 references.) (YDS)

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MAKING SENSE OF ENVIRONMENTAL EDUCATION RESEARCH AS AN EVIDENCE BASE

Paper for presentation in the SIG/Ecological and Environmental Education Symposium on *'Making Sense of Research in Environmental Education'* at the *Annual Meeting of the American Educational Research Association*, Seattle, 10-14 April 2001.

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Mark Rickinson, Senior Research Officer, National Foundation for Educational Research, The Mere, Upton Park, Slough, SL1 2DQ. UK.
Tel: +44 (0)1753 574 123. E-mail: m.rickinson@nfer.ac.uk

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INTRODUCTION

Educational research in the UK has recently seen a growth of interest in reviews of research as a means of improving the links between educational researchers and educational practitioners (Foster and Hammersley, 1998; Bassey, 2000; Davies, 2000b; Evans and Benefield, 2000). This comes in response to considerable criticism over recent years about the limited impact of educational research on policy and practice, and the development of notions of evidence-based and evidence-informed practice in education (e.g. Hargreaves, 1996; Tooley and Darby, 1998; Hillage *et al.*, 1998; Davies *et al.*, 2000).

Looking within the field of environmental education research, there are signs of similar kinds of arguments and developments. Palmer (1999:394), for example, proposes a need for 'policy and practice in environmental education to continue their movement away from a randomness of approach that leaves much to chance, towards research-based endeavours that encapsulate reliability and some of the realities of human motivation and cognition'. In a similar way, Reid's (2001:4) introduction to a recent edition of a practitioner journal argued that: 'Inspecting the evidence base is a welcome corrective to authoritarian exhortations and political conjuring that tries to make some forms of environmental education appear while others disappear'. His view is that 'good and bad practice in environmental education should rely on tradition and the power of persuasion less, and on scholarship and enquiry more' (ibid.:4).

Against the backdrop of these kinds of arguments, this paper reflects upon the experience of undertaking a review of research evidence in a particular part of the environmental education research field - namely, recent empirical studies of learners and learning in primary or secondary school environmental education. The purpose of the review was to examine the nature and quality of the current research evidence on students and their learning in environmental education. The concern with evidence was motivated by two considerations. Firstly, it responded to the tendency of previous analyses of the field to focus on methodological trends more than research findings (e.g. Williams, 1996; Palmer, 1998; Hart and Nolan, 1999). Secondly, it recognised that claims have been made that environmental education theory and research have overlooked 'the children who are the subjects of environmental education' (Payne, 1998:20). The review contended that efforts to address such

shortcomings need to be informed by a thorough and grounded understanding of what studies have, and have not, been undertaken on students and learning, and what is known, and not known, from the evidence that these studies have generated.

The overall report and findings of the review will be published later this year (Rickinson, forthcoming).[1] The purpose of this paper, therefore, is not to discuss what the review found out about the evidence base on learners and learning. Rather, it is to problematise the review's methodology, through an exploration of three aspects of the review process that were either problematic during its undertaking or have become the source of concern since the project's completion. These focus on the processes of critiquing research evidence; synthesising research findings; and suggesting implications for research users. The underlying aim of this paper is to explore further the possibilities, and the challenges, of trying to make sense of research evidence in environmental education.

The paper will begin with an outline of the review's aims and rationale, followed by a description of its methods and approach. Attention will then turn to the three aspects of the review process that were experienced as problematic. A brief consideration of emerging issues in relation to reviewing environmental education research evidence concludes the paper.

REVIEW AIMS AND RATIONALE

The review focused on a particular part of the environmental education research field; namely, studies published between 1993 and 1999 that had investigated, in some way, learners and learning in the context of primary or secondary school environmental education. The aims of the review were threefold:

- To chart the nature of the current evidence base on learners and learning in environmental education in terms of its major foci, strengths and weaknesses.
- To identify key messages emerging from this evidence base for each of the major foci within the area, and assess the limitations of these in terms of empirical underpinnings and generalisability.
- To raise questions about the nature, quality and accessibility of recent environmental education learning research, and suggest priorities for future work.

[1] A summarised version of the review's main outcomes was also published recently in a UK practitioner journal (Rickinson, 2001).

The rationale for this undertaking encompassed several considerations. Firstly, recent descriptions of the field have highlighted its rapidly expanding size and increasingly diverse nature, particularly over the last ten years (Palmer, 1998; Hart and Nolan, 1999). In view of this growth and diversification, a need was seen for work focused on making sense of and critically analysing the field of environmental education research.

Secondly, the review argued that there was a particular need for reviews focused specifically on the nature and quality of the empirical evidence within the field. This recognised the fact that several of the reviews that have been undertaken in the field have been either bibliographic in nature (Iozzi, 1981; Andrew and Malone, 1995; Marcinkowski and Mrazek, 1996; Wagner, 1997; Foskett and Marsden, 1998), or methodological in focus (Robottom and Hart, 1993; Williams, 1996; Palmer, 1998). Furthermore, those reviews that have been concerned to collate and analyse research findings have tended to do so for particular kinds of studies on very specific topics. Examples include reviews of research on: the affective domain (Iozzi, 1989); knowledge and affect (Zimmermann, 1996), knowledge and behaviour (Newhouse, 1990), interventions and behaviour (Zelezny, 1999), learning outcomes (Leeming *et al.*, 1993), outdoor experiences and attitudes (Keighley, 1997), sources of environmental sensitivity (Chawla, 1998b), and student understanding of global atmospheric issues (Boyes and Stanisstreet, 1996). These articles have provided useful overviews of recent research findings, often with detailed critical commentary and discussion of implications for practice (e.g. Iozzi, 1989). Their specificity of focus, however, has usually meant that they have discussed studies of a broadly similar methodological nature. (An important exception is Chawla's (1998b) review of research on sources of environmental sensitivity which discussed a variety of qualitative and quantitative studies).

Therefore, the review sought to focus specifically on the nature of the research evidence in an area of the field that was broad enough to include studies with a variety of approaches and foci, but also focused enough to enable detailed examination and discussion of individual studies' findings. Research on learners and learning was seen as an area that fulfilled these requirements in that it represented a definable area within the literature that contained a variety of research topics and approaches.

Thirdly, the focus on learners and learning also responded to growing recognition of the importance of research on students and their learning, both within the field of environmental education research (Payne, 1998; Rickinson, 1999), as well as in educational research debates more generally (Erickson and Shultz, 1992; Cooper and McIntyre, 1996; Rudduck *et al.*, 1996; Pollard *et al.*, 1997; McCallum *et al.*, 2000).

Arguments made by such authors suggest 'a lack of consideration in environmental education theory and research practices about the children who are the subjects of environmental education' (Payne, 1998:20), and a situation in educational research more generally where 'virtually no research has been done that places student experience at the centre of attention' (Erickson and Shultz, 1992:467). The review aimed to establish insights into what studies had, and had not, been undertaken on students and learning, and what was known and not known from the evidence that these studies had generated.

Fourthly, the concern with research findings drew upon the notion of evidence-focused reviews, in particular Foster and Hammersley's (1998:610) argument that 'the main channel of communication between researchers and lay people ought to be reviews of whole fields of research, rather than reports of single studies'. This was not to suggest an unproblematic acceptance of the concept of evidence-based practice or a simplistic view of the relationship between research and practice. Rather it was to argue for a concern for research evidence and what this might tell us in the field of environmental education.

Finally, this review sought to complement Hart and Nolan's (1999) recent analysis of the field. In adopting a similar time-scale for included studies, it aimed to examine the field at a similar time in its development. However, in specifically focusing upon a particular part of the field, it was hoped that this review would be able to explore the findings of individual studies in more detail than was possible in Hart and Nolan's wide-ranging analysis of the entire field. Indeed, the delineation of the scope and direction of this review was strongly informed by a lengthy discussion with one of the authors of that review (Hart).

REVIEW METHODOLOGY

In its methods, the current review sought to be: *systematic* (in terms of having clear criteria for the inclusion/exclusion of research studies, and a common framework for reviewing all included articles); *comprehensive* (through using a variety of searching techniques and checks); and *analytical* (in terms of critically analysing the strength and validity of individual studies' findings, as well as the evidence base as a whole).

Selection Criteria

The key dimensions of the work were clearly defined at the outset (Figure 1). These were driven by the focus and rationale outlined above. The focus on school-based

environmental education meant that research on any environmental education activity undertaken either in school or under the auspices of school (such as a residential field course as a school group) was included. What was excluded, then, were investigations of activities organised outside of the school context such as summer outward bound programmes (e.g. Hattie *et al.*, 1997). The review also excluded research on environmental learning amongst university students (e.g. Ballantyne and Packer, 1996) and beginning teachers (e.g. Payne, 1997).

Figure 1 : The Key Dimensions of the Review

Overall focus:	Empirical studies on learning and learners in the context of school-based environmental education
Time scale:	Work published 1993–1999
Age range:	Primary and secondary age students (ISCED Levels 1–3)
Geographical scope:	International (but, for pragmatic reasons, only articles published in English)
Sources:	Published articles, books and monographs, and government/ international publications

These **exclude**:

- Publications that have no empirical component
- Studies of environmental education not undertaken in or through schools
- Studies of teachers, or adult learners or university students
- Research published prior to 1993 or in languages other than English
- Unpublished work such as doctoral and masters theses.

Search Methods

Relevant literature was identified from a number of different sources. These included:

- *Bibliographic data-bases* – Searches were undertaken of several educational research databases (such as the British Education Index, ERIC, the Australian Education Index, and Child Data), as well as more specialist records (SIGLE for grey literature, and REGARD for ESRC projects). For all of these the key word 'environmental education' was used, in association with a number of other related search terms. These yielded a large number of titles that were then selected manually on the basis of abstracts and descriptors.
- *Journals/previous reviews* – The database searches were supplemented by manual searches of the contents of key research journals in the field (*EER*, *JEE*, *AJEE*, *CJEE*, *IRGEE*), and previously published reviews and bibliographies, from which articles of potential relevance were identified and copied.
- *Researcher networks* – A further source of information was researchers currently active in the field; requests for information for the review were communicated to researchers internationally via the FERN Environmental Education Research

Network (UK and Eire), the Environmental Education Research e-mail discussion list (international) and the website of the North American Association of Environmental Education.

As well as these initial sources of information, the identification of materials was an ongoing process. Reading selected publications led to the identification of further references of potential relevance. Indeed this was one way of working towards comprehensiveness in the literature search, in that searching continued until no new citations arose from the reference lists of included articles.

The purpose of exploring all of these sources was to identify and collect publications that corresponded with the focus of this literature review. This involved searching and selecting on the basis of *relevance*. It is important to emphasise that there was no consideration of quality during this initial searching and selection process. (The reasoning behind this is explored later in relation to critiquing the research evidence). Studies were only excluded if they did not correspond with the stipulated substantive focus or failed to match any of the key dimensions outlined above. In the end there were 110 publications included in this review, the vast majority of which were journal articles, along with a small number of books and research reports.

Review Processes

The selection of relevant materials was followed by the process of reviewing individual publications. In the interests of ensuring commonality and comprehensiveness in this process throughout the project, a review framework was devised (Appendix 1). This was adapted from a similar framework used by the author during an earlier review of research on young people's attitudes to education, employment and training (Morris *et al.*, 1999). In the context of the current work, the framework was designed to generate information for three purposes:

- *cataloguing and reporting* – basic descriptive information (such as full publication details, geographical location and age of learners), as well as a category descriptor (concerning broad substantive focus of a study) were included in order to facilitate cataloguing and subsequent analysis and reporting of large numbers of studies;
- *evaluation* – as well as descriptive information, this framework was also designed to generate evaluative information about the depth of detail provided about the different aspects of each study (conceptual/theoretical framework, sample, methodology, validity measures, methods, main findings, key conclusions, and author's view of implications), and any particular strengths and potential weaknesses that were apparent to the reviewer within the work as reported; and
- *evidence base analysis* – the third purpose of the framework was to enable the generation of ideas about (i) the contribution that individual papers made to the evidence base (i.e. main findings, key conclusions, author's view of implications,

researcher's view of implications), and (ii) cases of agreement and disagreement between the evidence generated by different papers (i.e. links).

The process of reading and reviewing articles using the framework began as soon as the first references became available. Initially this occurred in an uncoordinated manner, in that articles were not examined in any particular sequence, just as they arrived. Before long, though, the growing number of relevant publications meant that the issue of sorting and categorising became a more pressing one. This marked the beginning of a categorising process that continued to evolve throughout the course of the review. This involved experimenting with ways of making sense of the evidence base through looking for patterns of commonality and differences between the substantive foci of individual studies' findings.

The emphasis on the substantive foci of their findings, as opposed to their methodological approaches, was deliberate in light of the concern with the evidence base. This was reflected in the labels that were given to these emerging categories, all of which were phrased in terms of 'Studies *that generate evidence about* (for example) students' learning outcomes'. In other words, rather than grouping studies using a certain methodological approach or focusing on a particular topic, the categories in this review constituted an area of the evidence base and the studies that contributed to this. Any one study could thus be recorded in several categories if its findings were relevant to several areas of the evidence base.

Once these categories had been established and the majority of the references assigned to one or more of them, the articles were reviewed by category. The reason for reviewing the articles in this way was to facilitate the development of a more synthetic understanding of the findings pertaining to each of the major foci of the evidence base. It is important to emphasise that there was flexibility within this approach in that individual articles often raised questions about the distinctions between categories and necessitated alterations or refinements. This was seen as an integral part of the review process.

Reviewing the research studies within each of the substantive categories involved two inter-related processes: evaluation of the strengths and weaknesses of the empirical evidence; and the identification of key messages through synthesis of individual studies' findings. The nature and difficulties of these two processes of critiquing the research evidence, and synthesising research findings, are explored in the ensuing section.

DIFFICULTIES IN MAKING SENSE OF EVIDENCE IN ENVIRONMENTAL EDUCATION RESEARCH

This section explores in more detail three aspects of the review process which were either problematic during the review's undertaking or have become the source of concern since the project's completion. These focus on:

- critiquing research evidence;
- seeking synthesis; and
- suggesting implications for research users.

For each of these, an attempt is made to outline, and critically reflect upon, the strategy adopted and the problems experienced, and to consider what questions these might raise about reviewing evidence in environmental education.

Critiquing Research Evidence

It was recognised from the outset that a review focusing on the evidence base would need not only to *report* on recent research findings, but also to *evaluate and comment* upon their quality. This was probably the most challenging part of the review, and the aspect of the work that I still feel least sure about. The approach that I adopted was to avoid initially the issue of quality in terms of the criteria for selecting studies for the review (as described earlier, the criterion used instead was relevance to the substantive focus of the review). In other words, unlike many examples of systematic research reviews (e.g. Evans and Benefield, 2000), in this review research studies were not included or excluded on the basis of their methodological validity. This reflected the fact that one purpose of the review was 'to chart the nature of the evidence base on learners and learning', which necessitated a consideration of all (rather than a selection of) the research that had been undertaken on learners and learning in environmental education. The onus initially, then, was on generating an understanding of what studies had been undertaken, not on analysing the findings from a smaller number of studies with particular methodological characteristics.

Furthermore, I did not see that there were clear-cut quality criteria that I could easily adopt for the purpose of investigating environmental education research. Within the literature on systematic reviews, for example, 'the notion of a "hierarchy of evidence", with randomised controlled trials (RCTs) and meta-analyses of RCTs at the top, and the opinions of respected authorities, expert communities and descriptive

studies at the bottom' (Davies 2000a: 291-2) seemed unhelpful for making sense of the diverse field of environmental research. Meanwhile, within the environmental education research literature, while there were research reviews that had undertaken methodological critique of quantitative studies (e.g. Leeming *et al.*, 1993), there was little agreement over the nature, or appropriateness, of criteria for qualitative inquiries (see, for example, contributions to *Environmental Education Research* 6, 1, Special Issue: Qualitative Methods of Inquiry).

In view of this situation, I chose to proceed in a more inductive manner whereby the emphasis was on engaging with the current evidence and seeking to make sense of it, rather than working with a set of hard and fast criteria by which to evaluate each included study. The way in which this actually took place was through reading individual studies and noting points that were felt to be strengths and weaknesses in a methodological sense. The emphasis, therefore, was on working in the particular of specific studies, and trying to think of ways in which the validity of findings might be called into question or the consistency between the findings and the conclusions challenged. The aim was to come to an understanding of what kinds of statements could, and could not, be made on the basis of individual studies' findings, and then of groups of studies' findings (the issue of synthesising from different studies is considered separately below). This process was informed by: previous reviews and methodological papers that had critiqued particular kinds of studies and highlighted certain methodological shortcomings and/or strengths; methodological arguments within individual studies which in turn raised questions about how other similar studies had been undertaken; and my own previous methodological readings, and research/literature review undertakings.

In reviewing individual studies, three principles emerged as useful and important. These included:

- *Critiquing from within* – A conscious effort was made to review pieces of work from within the research tradition (or paradigm) that the research had been conceived and undertaken. For example, correlational studies were considered in terms of positivist research traditions, while qualitative case studies were examined from the perspective of interpretivist inquiry. The concern was to examine how well the researchers had carried out what they had intended according to the paradigm in which they were operating. The aim was not to critique articles in terms of the paradigm in which they had chosen to investigate a particular topic or question.

- *Sensitivity to context* – Care was taken to remain mindful of the situations in which research projects take place, and the difficulties that can often hamper such work. For example, criticisms that might be leveled at an internationally funded research project could be quite unjustified in relation to a small-scale action research study by one teacher researcher. Furthermore, research reports differ depending upon the circumstances in which they are commissioned and upon their intended audiences. For example, methodological details might be less of a priority in a publication intended for policy audiences, than one prepared for academic readership.
- *Distinguishing evidence* – Importance was also attached to trying to draw distinctions between evidence that seemed to be more reliable or conclusive, and evidence that appeared more questionable or preliminary. This involved, for example, distinguishing between claims based on empirical findings and those based on speculation about empirical findings, highlighting differences between statistically significant results and ones based on description of trends, and differentiating between survey findings based on very small samples and those based on larger representative samples.

Looking back on this process of critiquing the research evidence during the review, I can see that it was characterised by three kinds of difficulty. One problem was simply the challenging nature of judging other people's published research. It is one thing to discuss and report upon data in the form of research participants' (usually anonymised) survey responses, interview accounts, and/or observational descriptions, it is another to draw upon other researchers' work as your primary data and specifically set out to analyse and evaluate them in a very open and non-anonymous manner. Clearly this is a crucial part of the development of any field of research, but that does not make it any less challenging either intellectually or personally when it is you that has to make the judgements and report them publicly. Issues of quality with respect to any research are inevitably highly contentious and complex, and I would add that this is particularly so in a field such as environmental education where methodological differences are deep-seated and hotly debated.

A second area of difficulty was the critical appraisal of qualitative evidence. This was problematic for two reasons. Firstly, relative to quantitative studies, the reviewing of qualitative research has to deal with more diverse genres of inquiry (Hart, 2000; Davies, 2000b), and the fact that there are fewer examples of critical analysis of qualitative inquiry in previous reviews, and little agreement over criteria of quality (see, for example, contributions to *Environmental Education Research* 6, 1). Secondly, there was a marked imbalance within the identified literature between the large number of quantitative studies and the much smaller number of qualitative inquiries. This presented difficulties in light of the decision not to use a set of clear-

cut quality criteria from the outset. This meant that there was a strong dependence on *comparative* analysis between studies in terms of their methodological characteristics, rather than an examination of each study in relation to a common set of criteria. More detailed critical appraisal was therefore easier where there were larger numbers of studies of a similar methodological kind. In this way, the relative shortage of qualitative studies within the review meant that the critical evaluation of this type of evidence was less detailed and developed.

A third issue which arose during the conduct of the review was that the critical analysis of evidence proved a more complex process than had been originally envisaged, in that it operated at different levels. It became clear that strengths and weaknesses in evidence could be identified not only at the level of individual studies, but also at the level of the evidence base as a whole. Each of these levels involved quite different issues and concerns. At the level of individual studies, strengths and weaknesses were more in terms of methodological coherence, research designs, analytical procedures, validity of claims and so on. At the level of the evidence base, meanwhile, issues such as the diversity of evidence types, the nature and variety of substantive foci, and the extent of interconnections between types of evidence and types of foci, were more important. This meant that it became necessary to think carefully about the level at which different kinds of strengths and weaknesses were relevant, and how these different levels might inter-relate, overlap or even conflict. My feeling is that the idea of different levels of critique is an important one for the future development of evidence-focused reviews, particularly as much of the discussion about systematic reviews of research evidence seems to have focused more on the question of judging individual studies, and less on the issue of what might be seen as judging the quality of research fields.

Stemming from these three difficulties with critiquing research evidence, I would suggest that future reviews of environmental education research evidence may well benefit from:

- **being undertaken by a number of researchers working collaboratively, rather than by single individuals working in relative isolation** – This recognises the personally and intellectually challenging nature of reviewing, critiquing and synthesising research. It also responds to the crucial need for in-depth discussion and debate about the evidence during the process of a review, which would arguably be facilitated by a collaborative team approach. Indeed, Hart and Nolan

(1999:3) in their review, report how they 'engaged in reflective discourse to create a collaborative interpretation and a critique of the research'. Such a way of working might be informed by procedures and processes developed in connection with systematic reviews of research in the health sector (Sheldon and Chalmers, 1994) and, more recently, in education (Evans and Benefield, 2000) with their inclusion of advisory groups of experts as part of the review process.

- **a deeper engagement with literature and debates on criteria of methodological quality *before*, as well as during, the review process** - This would, of course, need to include consideration of ideas both within and beyond the environmental education field. The purpose, though, would be to generate, in an involved and reflexive manner, indicators of quality for different genres of evidence that would be expected to feature in the review. While developed at the outset, it would also be important, in my view, for these indicators or criteria to be open to question during the review process. Of particular importance, I would suggest, might be situations where the indicators did not seem relevant or appropriate to a particular study or group of studies and therefore in need of amendment, or whole-scale revision. This process of amendment or revision, though, would be reported as part of the review, with the hope that different reviews would provide not only new framings of the field and syntheses of findings, but also new ways of conceiving and evaluating research evidence.

- **greater consideration being given to the notion that research evidence can be conceptualised and evaluated at different levels** - Two levels that have emerged from this review are the level of individual studies and the level of the evidence base as a whole. There may well be other possible levels, and indeed, more sophisticated ways of conceptualising research fields and evidence bases that will come from further exploration. My sense is that more attention could usefully be given to the idea of quality of research fields, as well of individual research studies. One challenge is of developing language and metaphors with which to talk about evidence bases in this sense.

Seeking Synthesis

Another central aim of the review was to 'identify key messages emerging from the evidence base for each of the major foci within the area'. In other words, there was a desire to *synthesise* the findings of different studies on similar topics in terms of key messages or 'overarching summarising statements', which not only included all of the available evidence on a particular topic, but also reflected (in their phrasing) the specificity and strength of the findings upon which they were based.

The interest in synthesis stemmed from a desire to make sense of evidence about learners and learning in environmental education in a way that might be useful to research users, as well as researchers. As outlined earlier, the review was informed by the view that previous reviews in the field had focused on methodological matters more than on research findings. Their products were therefore arguably more relevant

and useful to researchers, than to research users. In line with the argument that 'the main channel of communication between researchers and lay people ought to be reviews of whole fields of research, rather than reports of single studies' (Foster and Hammersley, 1998:610, Davies, 2000b:366), value was seen in seeking ways of summarising the findings from groups of studies focused on particular aspects of learners or learning in environmental education.

The way I undertook this was in terms of exploring the areas of commonality and difference between studies' findings, and trying to generate overarching summarising statements which encompassed and expressed these as key messages. This kind of approach, I see now, was similar to the way in which I approached the task of critiquing the research. That is, I did not use a specific named *a priori* method from the outset. The main reason for this was that the methods of research synthesis which featured in the literature either required the selection of particular kinds of 'high quality' studies (such as 'best evidence synthesis'), or seemed strongly orientated towards quantitative research with little relevance to other kinds of inquiry (such as 'vote counting methods' or 'meta analysis') (for details on these approaches see, for example, Davies, 2000b). Given these kinds of available techniques, none of which were felt to be adequate for the task of investigating the nature and quality of environmental education learning research, I opted instead for a more inclusive and inductive approach to synthesis. This involved generating overarching summarising statements through reading, rereading and trying to synthesise the findings reported in each of the studies for a particular substantive focus. In seeking to identify key messages across studies, attention was paid to trying to include all of the evidence available on a particular topic, as well as phrasing the summarising statement in a way that reflected the nature and strength of the findings upon which it was based.

Looking back, this process of synthesis was conceived and undertaken in a relatively unproblematic manner. Unlike the recurring challenges and concern associated with the critiquing of the evidence, the generation of key messages was not found to be an inherently difficult process during the review. That is not to say that there were not challenges in pulling together the large amount and (at times) wide variety of empirical findings for particular topics, or with developing the wording of summarising statements so as to reflect subtleties in a succinct manner. These sorts of challenges, though, were experienced more as practical ones, rather than as being

threatening in a conceptual or theoretical way. It is only now that I am beginning to question what this process was actually about, what assumptions it made, what its limits might have been, and how it might have been more carefully theorised and operationalised.

There are two particular concerns that have emerged through reflection since the completion of the review. The first of these is the concern that synthesis can result in an *over-simplification* of research evidence, whereby the impression is given of greater clarity within the research evidence than is, in fact, warranted. This is a point raised by Gough (1999) in relation to a review of significant life experiences research (Chawla, 1998a), which made a statement about two different studies yielding 'markedly similar results'. Gough (1999:413-4) criticises this statement for falsely:

> 'inviting the reader to accept that the different methods and questions "reveal" parts of the same "objective picture" [...when in fact ...] The similarity between [the two studies' findings] is not surprising given that they were both working in the same research tradition, using the same disciplined procedures for data production and interpretation'.

This notion of attaching too much significance to fairly inevitable similarities underlines the need for synthesis to pay careful attention not only to similarities and differences in the *findings* of studies, but also to similarities and differences in the *methodological characteristics* of studies. Another potential source of over-simplification comes not so much from the overplaying of similarities, but from the overlooking of differences. The risk here is that an attempt to synthesise can easily become overly concerned with identifying similarities between studies, rather than with highlighting their differences.

A second concern about synthesis is whether it is a process based on a positivist logic, and therefore better suited to dealing with quantitative findings, rather than qualitative ones. This is the argument put forward by Noblit and Hare (1988:12), who see most approaches to knowledge synthesis (such as meta-analysis) as 'quantitative approaches [which] require a determination of a basic comparability between phenomena so that data can be aggregated for the analysis' (ibid.:17). This, in their view, is unhelpful for the purpose of dealing with interetivistic research because it ignores the 'meaning in context' and the ethnographic uniqueness that is so central to ethnographic and qualitative inquiry. On this basis, they propose the alternative

concept of 'meta-ethnography' which 'seeks to go beyond single accounts' by revealing 'the analogies between the accounts' through the 'translation of qualitative studies into each other' (rather than the development of 'overarching generalisations') (ibid.: 13 and 25).

Unfortunately, I was not aware of this approach at the time of undertaking the review. Thinking about it in relation to the review, though, not only highlights the importance of synthesis in reviewing research, but also raises a number of crucial questions about what is involved in synthesis and what kinds of synthesis are useful for which types of evidence. In particular, questions emerge about:

(i) the subject matter of synthesis – exactly what aspects of individual research studies are we trying to synthesise, and can/should this vary for different kinds of research?

(ii) different types of synthesis – if meta-analysis is positivistic, and meta-ethnography is interpretivistic, then what other kinds of synthesis are possible and what might they look like?

(iii) synthesis between paradigms – if synthesis itself is paradigmatic, then is synthesis across different paradigms/genres of research possible?

(iv) the limits of synthesis – are there situations where more is lost through synthesis than is gained, and, if so, what alternative processes might be more appropriate?

Overall, it would seem that there is a need to open up the notion of synthesis for closer scrutiny in relation to different kinds of research evidence and different kinds of reviews for different kinds of audiences. What is important is that synthesis does not necessarily have to mean statistical meta-analysis; alternatives notions such as meta-ethnography are emerging and reviewers of environmental education research would seem well placed to draw upon, and contribute to, the development of such approaches.

Suggesting Implications for Research Users

In line with its focus on the evidence and what it might tell us, the review sought not only identify key messages, but also to highlight issues and challenges arising from these for research users, as well as researchers. This task of suggesting implications for research users proved a further challenging aspect of the review. Difficulties, for example, were experienced with:

- the wide variety of potential user groups in environmental education, and trying to think about which kinds of users might be interested in the evidence discussed in the review and the ways in they might make use of it;
- the recognition that research evidence will rarely translate easily into simple ingredients for developing environmental education practice or policy, particularly as 'factual information cannot, in itself, tell us what should be done' (Foster and Hammersley, 1998:621);
- trying to work out which research evidence should be mentioned in what ways, in how much detail, and with what qualifiers, in relation to implications; and
- the danger that 'practical recommendations [can] effectively close down discussion of those issues' with possible negative consequences for the development of educational provision and reflective practice (Foster and Hammersley, 1998:624).

On reflection, I see that my identification of implications for research users was characterised by two main strategies. Firstly, I tried to raise issues or highlight findings *for consideration* by research users, rather than making specific recommendations about how practice ought to change in light of research findings. For example, a number of characteristics of learners emerging from the research evidence (such as the idea that students' curricular and pedagogical preferences can differ) were highlighted for consideration in relation to the question of 'how [they] might be taken into account in teaching and learning practices within environmental education'. Thus, I did not attempt to actually stipulate possible ways in which practice might need to change in order to take account of such learner characteristics.

Secondly, I tried to emphasise the way in which research findings need to be seen in relation to the assumptions that the research has made about environmental teaching or learning, and the nature, aims and context of the particular programme that was being researched. For example, in reporting certain aspects of environmental science teaching that research on students' ideas about global environmental issues had identified as detrimental to students' understanding of such issues, it was stressed how the studies 'each make assumptions about the nature of environmental teaching which may or may not be shared by individual research users coming to consider their possible implications'. This bears some similarity to Foster and Hammersley's (1998:623) argument that if evaluations or prescriptions are to be drawn then: (i) these are better expressed in 'conditional' terms, that is 'given commitment to this goal, then policy or practice meets or falls short of what is required in the following respects; or, given this goal and these particular value concerns about means, the following course of action would be desirable'; and (ii) they need to fully explicate

the criteria by which a policy or practice is seen to be succeeding or failing (for evaluations), and/or the assumptions being made about goals and means (for prescriptions). That said, I have no doubt that I could have gone further in stipulating the kinds of conditions and assumptions that underpinned the findings which featured in the section on implications for research users.

Overall, I am sure that the review did no more than scratch the surface of the challenges inherent in undertaking reviews for the purpose of communicating with research users. One thing it has made clear, though, is that reviews are not just about an understanding of research, but also an understanding of practice, and most crucially, the relationship between research and practice. This calls into question the idea of reviews being undertaken solely by researchers. The review I undertook represents, what Bassey (2000) would term, an 'academic review'. Bassey draws a distinction between an *academic* review, 'a critical and analytical account of the state of public knowledge of the topic' aimed primarily at other researchers, and a *user* review: 'a form of professional paper which is devised and written by researchers and users working together' with the aim of critically informing the thinking of a particular policy maker or practitioner audience (ibid.:25). The latter, he explains, would arise from an academic review but would be much briefer and more readable in style and, most importantly, would focus on specific issues of relevance to particular groups of users. It would seem that reviews of this kind are currently rare in environmental education, but could, in fact, represent an important and promising opportunity for the field, its practitioners and its researchers. I would add, though, that their undertaking needs to be informed by ideas and debate about:

- **the relations and differences between the worlds of research and those of practice** – In a paper entitled 'Why research into practice does not go' Hammersley (1998), for example, proposes a number of limitations on the ability of research to provide useful insights for practice. These include: the fallibility of research-based knowledge, the relatively slow rate of research knowledge generation, its tendency to focus on single issues, its generalised character, and its inability in itself to justify practical evaluations and recommendations. Furthermore, he argues that, practitioners act upon much more than factual knowledge, and 'research will only have an impact if it finds a place in a motivational context which encourages practitioners to use it.' (ibid.:16).

- **the possibility that research knowledge can have negative as well as positive consequences for practice** – Another point made by Hammersley (1998:17-21) is that the production and dissemination of research knowledge can be detrimental to practical decisions and outcomes where research knowledge is: false and so leads

practitioners astray, sound but is used for bad purposes, too plentiful and so confusing, too complexifying (as opposed to simplifying) and so demotivating or disorientating, inappropriate for the local context, and used to legitimate bad courses of action and vice versa.

- **the multi-faceted and heterogeneous nature of research users** – Foster and Hammersley (1998:613) warn that 'it is important to remember that there is not one single, well-defined, and internally homogenous professional audience, but rather multiple, overlapping publics whose boundaries and characteristics are ill-defined'.

- **the potential impact of 'researchers as sideline audiences'** – Foster and Hammersley (1998:612) also highlight how 'even if the intended audience is non-researchers, the reviewer will nevertheless be aware that fellow researchers are also likely to read the review' and this can 'distract the reviewer from providing what would be most helpful for policy-makers or practitioners'.

These kinds of ideas may well be important in shaping responses to calls for environmental education to become more evidence–based, as seen in the earlier quotes from Palmer (1999) and Reid (2001).

CONCLUSION

At its heart, this paper is about the complexity of reviewing research evidence in environmental education. Set against arguments for environmental education to become more evidence-based (e.g. Palmer, 1999; Reid, 2001), it therefore represents a call for a greater appreciation of, and more critical discussion about, the challenges inherent in making sense of evidence in the field through reviews of research.

Bassey (2000:24) has argued that the undertaking of research reviews 'deserves the same level of academic esteem as the conduct of empirical research'. I would echo this, but argue that it is not only the same level of 'academic esteem' that is needed, but more importantly the same level of methodological reflexiveness and deliberation. The issues discussed in this paper have made clear that reviews, like all research endeavours, are intricately tied up with a whole host of methodological challenges. In particular, they are shaped by varying conceptions of research and evidence, differing notions of synthesis, ideas about the relationship between research and practice, and issues of audience and representation.

There are, though, many kinds of research reviews, and many ways of making sense of, and synthesising, research (Davies, 2000b). I would argue that the methodological diversity of the current environmental education research field is not yet matched by a similar diversity of approaches for reviewing and making sense of this research. I see an important need, therefore, not only for a greater number and variety of research

reviews in the field, but also for these to have much stronger connections to the field's tradition of methodological discourse and debate.

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Appendix 1: The Review Framework

Reference:

Category Descriptor: the emerging category(ies) of relevance **Date of review:**
Country of Origin: country(ies) where the work was undertaken **Age of learners:**

Research aims	a summary of the aims of the research study as reported by the researcher in their paper
Project details	name and funding details of any broader research project (if mentioned)
Conceptual/ theoretical approach	summary of the key conceptual and/or theoretical assumptions that underpin the work reported (but only in so far are these are explicated and acknowledged by the author)
Sample	details of sample sizes, sample characteristics, and selection procedures and rationale
Methodology	the broader epistemological and theoretical framework that surround and underpin the methods of the study (but again only in so far are these are explicated and acknowledged by the author)
Validity measures	any measures aimed at ensuring validity or reliability (howsoever conceived) that are reported by the author

Methods (data collection and analysis)	summarised details of the reported procedures of data collection, and of data analysis
Main findings	summary of the study's main findings as reported by the researcher
Key conclusions	summary of the main conclusions drawn from the study's findings by the researcher
Author's view of what findings tell us	summary of the key implications and lessons that the researcher draws from the study
Reviewer's view of what findings tell us	reviewer's view of the key implications and lessons emerging from the study
Strengths and weaknesses	aspects of the study that the reviewer perceives as particularly valuable or potentially problematic/limited
Links	brief notes about (i) points of commonality or divergence between this and other studies in the review e.g. similar or very different findings on a similar topic, methodological links or conflicts etc. (ii) links with other categories within the review, or examples of significant differences between papers within the same category (leading to sub-categories)